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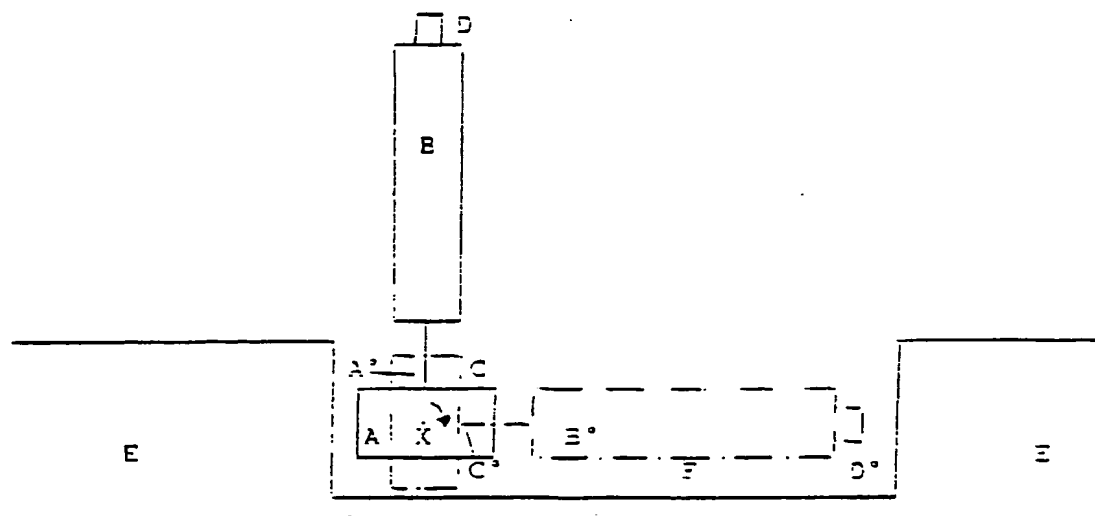
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(54) Title: **INTERNAL POINTING SYSTEM FOR PORTABLE COMPUTERS, WITH A JOYSTICK OF VARIABLE BULK**



(57) Abstract: Pointing system for portable computers, palmtops, pocket calculators, PDAs, cellular telephones and watches with electronic processor, consisting of a joystick formed by a base, a rod and possible control buttons. This invention is characterized by the fact that the external position and bulk of the joystick can vary according to its use by the user. More specifically, when the joystick is not used, it can be inserted, with no external bulk, into the same physical structure of the computer; on the contrary, when it is used, at least the rod comes out with normal functions and bulk.

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"INTERNAL POINTING SYSTEM FOR PORTABLE COMPUTERS, WITH A  
JOYSTICK OF VARIABLE BULK"

**Description**

**Technical Field**

5 The present invention concerns the technical sector relating  
the production of accessories for computers. In particular, it  
relates to the manufacturing of pointing devices.

**Background Art**

People normally know computers, which are programmable  
10 functional apparatus, formed by one or more processing units  
(units with one or more processors and internal memories)  
connected each other, controlled by internal stored programs  
that can do various calculations, including many arithmetic  
and logical operations, without being essentially necessary  
15 the human interaction during their working. In the following  
description, we'll refer to computers, or the like, meaning  
generally any machine able to accept structural input, to  
process it by a digital method (representing the values by  
means of discrete signals, the bits of the binary code 0 and  
20 1), according to prescribed rules, and to produce results as  
output.

Within the scope of computers, the "PCs" are well-known: PC  
means "Personal Computer" as they are designed to be used by a  
single person at a time and they are based on common producing  
25 standards of the information technology industry. Said  
computers have the relevant drawback of representing fixed

stations that cannot be moved and used in different places from the ones where they are installed.

In order to avoid this drawback, portable computers have been realized, consisting of any computer designed as a single  
5 physical structure containing processing units, storage, input-output and power devices, having reduced weight and bulk in order to be easily moved, manually carried and used in outer environments by a normal person.

Among portable computers, there are the "laptops", which are  
10 portable personal computers of various sizes, characterized by software and peripheral devices that are similar and generally compatible with the normal personal computers; the "palmtops", which are portable computers capable of performing various tasks, being of such a size that they can be held in one hand  
15 and activated with the other hand, characterized by specific software and peripheral devices, usually different from the ones of the laptops; the "handheld computers", which are portable computers being of such a size that they can be held in one hand and activated with the other hand, characterized  
20 by particular and specialized input devices, suitable to perform only certain tasks, said specialization being the feature that distinguishes it by the palmtop.

Portable computers, for the purposes of the present description, comprise also other computers of small variable  
25 sizes according to their use. Among them, there is the "PDA", acronym for "Personal Digital Assistant", a small portable

computer specifically projected for the organization of the personal activities; the cellular telephone, that is a small portable radiotelephone equipped with electronic processor making it a proper portable computer, which works thanks to a particular receiver-transmitter system that acts as a relay with the telephone network; the watch with electronic processor, that is generally a digital watch equipped with a processor by means of which it provides the user with different functions, from time reading to, for example, calculator or personal agenda.

Computers usually have a "cabinet", i.e. the physical case, the material frame containing the main components of a computer, and a "console", i.e. the control unit through which the user communicates with the computer, or the like, the physical structure that includes the components and the principal input-output peripherals by means of which the user interacts with the computer. Portable computers, in order to optimize their easiness of movement, transport and use in outer environments, often have a single material structure including both the cabinet and the console, a single physical set containing together processing units, storage devices, interfaces between user and computer and the battery, or other device, for the electrical supply of the apparatus.

The most computers are used by means of specific programs, drawn up as to give instructions to the computer, using the cursor, a special graphic symbol on the screen, for example a

bright dash or rectangle that shows the point where the characters corresponding to the pressed keys will appear, and also, in the applications or the operating systems, an arrow or other icon on the screen by which the user preferably  
5 interacts with the program, pointing the position where the next operation shall be done.

In order to move the cursor, or other object, on the screen, it's necessary to have a pointing device, that is a peripheral for the control of the cursor: as it is moved by the user, the  
10 cursor, or other object, moves on the screen. If the movement of the cursor, or other object, on the screen is always associated also to the position of the device, it's an "absolute pointing device", otherwise, it's a "relative pointing device".

15 Another distinction between the pointing devices can be done according to their relative position to the computer. For the purposes of this description, we'll refer to the pointing devices that are inside portable computers as "internal pointing devices", which are materially indivisible from the  
20 computers, physically and permanently connected to the same physical set comprising all the components of the computer. Vice versa, we'll call "external pointing devices" the devices materially joint to the computer only temporarily, generally by means of cables, or that fulfil their function far and  
25 physically divided from the computer, by means of infrared rays, radio waves and other methods of teletransmission.

In portable computers, an example of a generally external pointing device is the "mouse", a typical pointing device of personal computers, consisting, in its original mechanical form, of a small ball inserted in a case: the movement of said  
5 case by the user across a surface is encoded into directional signals used by the computer. On the contrary, a typically internal pointing device is the "touchpad", consisting of a board sensitive to the touch of fingers: this movement is encoded by the computer into directional signals. The  
10 "trackball" is another internal pointing device similar to the mouse, where the ball is not inside the case but is placed on two tracks, on which it is turned by the user's hand.

Among the external pointing devices, there is also the "joystick", a term that indicates a peripheral device of a  
15 computer, equipped with a handle by which we control the movement of the images on the screen, or more specifically a pointing device, generally relative, but for applications of industrial control, even absolute. The joystick is formed by a base where a rod, with at least two degrees of freedom, is  
20 pivoted, generally vertically and perpendicularly to the same base. The user controls the movement of the cursor, or other object, on the screen, by moving the rod in all directions but the perpendicular, which corresponds to the stand-by position associated to the absence or end of movement; it's possible to  
25 provide control buttons for the activation of software

function and the transmission of commands, both on the rod and on the base.

From a technical point of view, the movements of the rod by the user are encoded into instructions for the control of the cursor, or other object, on the screen, by means of at least  
5 two potentiometers (a type or resister with two sockets connected to the circuit and a third mobile one that puts up a variable resistance to the passage of electrical power according to the movement of the mobile socket, therefore an  
10 optimum transducer of mechanical phenomena into electrical phenomena). Said potentiometers, connected inside the base to the joint where the rod is pivoted, translate the movements of the rod in at least two directions into different electrical tensions, then encoded by at least two specific analog-to-  
15 digital converters (one for each space direction and for the corresponding potentiometers) into digital signals of angular or linear position used by the computer. As regards the control buttons, they are generally electrical switch and their pressure opens or closes a circuit to which the computer  
20 associates a particular software function or command.

At the present prior art, the internal pointing devices, being physically inseparable from the computer, optimize for construction the easiness of movement, transport and use in outer environments that characterizes portable computers, but  
25 their practical use often results too particular and "not quite natural" for the user.

On the contrary, the external pointing devices known at present are generally more spontaneous and "immediate" to use; as a matter of fact, while the internal pointing devices are specifically projected for portable computers, for example the trackball and the touchpad, and they are not provided for common non-portable computers, the external pointing devices, such as the mouse or the joystick, are usually provided both for common computers and portable computers, like universal ergonomic standards.

10 Accordingly, the present prior art shows a sort of dichotomy between the spontaneity of use of the external pointing devices and the easiness of movement, transport and use in outer environments of the internal pointing devices.

At present, there are not internal pointing systems that are physically indivisible from the computer and have such a simplicity and naturalness of use as the external ones.

#### Disclosure of invention

The present invention principally aims at eliminating this drawback, supplying an internal pointing system for portable computers, according to the above-mentioned definition, consisting of a joystick, characterized by the fact that it is indivisible from the same material structure containing the computer, physically and permanently connected to it, and that it has variable external position and bulk according to its use by the user. More specifically, when the joystick is not used, it can be inserted, with no external bulk, into the same

physical set of the computer and the other components; on the contrary, when it's used, at least the rod comes out with normal functions and bulk. In this way, said pointing system maintains, in the first case, the easiness of movement, transport and use in outer environments that characterizes portable computers, since there's no external bulk; in the second case, it maintains the typical naturalness of use of the common external pointing devices.

Reduced to its essential structure and with reference to the figures of the enclosed drawings, an internal pointing system for portable computers, according to the invention, comprises:

- means to move the cursor, or other object, on the computer screen, by a pointing device like a joystick that works by moving its vertical rod, perpendicular to its base;
- 15 - means to make the pointing system internal and joint to the computer, by its base embodied into the computer;
- means to reduce the bulk, by a system hiding the pointing device, or part of it, in a hollow located in the physical set that contains the components of the computer, so that
- 20 it makes no bulk when it's not in use.

Conveniently, this pointing system can be used for any type of portable computers, including laptops, palmtops, pocket calculators, PDAs, cellular telephones and watches with electronic processor.

25 Conveniently, this invention consists of an internal pointing device that is a peripheral for the control of the cursor, or

other object, on the screen, indivisible from the same physical set containing together processing, storage, input-output and power units.

Conveniently, this pointing device is formed by a base and a  
5 rod with at least two degrees of freedom; when the device is used, the rod is pivoted to the base nearly perpendicularly. The user controls the movement of the cursor, or other object, on the screen, by moving the rod in all directions but the perpendicular, which corresponds to the stand-by position  
10 associated to the absence or end of movement; it's also possible to provide control buttons for the activation of software function and the transmission of commands, both on the rod and on the base.

Conveniently, this pointing device has variable external  
15 position and bulk according to its use by the user: as a matter of fact, when it's not used, it can be inserted, with no external bulk, into the same physical set that contains all the components of the computer (processing, storage, input-output and power units); on the contrary, when it's used, at  
20 least the rod comes out with normal functions and bulk.

Conveniently, this pointing device, when not in use, can occupy no external space, as the user can insert it inside the computer by using different practical solutions: only some of them are hereinafter described and are not to be considered  
25 restrictive. The same technical solutions that we are going to describe permit also, by implication, to pull out the device

before its use, but, for illustrative purposes, their description refers only to the phase when the user has finished to use the joystick and inserts it into the physical set that contains all the components of the computer, and not  
5 the reverse phase when the user pulls out the joystick.

Conveniently, the bulk can be reduced in different ways, everyone characterized by the fact that the pointing system, or part of it, is included in the body of the computer.

Conveniently, according to a first practical solution, the  
10 base (A) of the pointing system swings round on its pivot system, at an angle of about ninety degrees regarding one (X) of its hypothetical central axes perpendicular to the rod (B). The rotation involves the entire pointing system, and the rod-base pivot does not change; consequently, the relation rod and  
15 rod-base pivot (C), and the connected potentiometers and analog-to-digital converters, with the control buttons, remain unchanged. Therefore, the rod (B) follows the base (A) in the rotation, so lying down in a specific hollow (F) inside the same material structure (E) containing all the components of  
20 the computer. The rod (B°) maintains, also in the new placement, the same position relative to the base (A°), even if it takes a different position compared with the entire computer. In this way, the user minimizes the external bulk of the pointing system, as the rod (B), which is the bulkier  
25 component, does no more occupy external space, like the base

(A) that is already partly embodied in the physical set (E) of the computer and now it shows a different face upwards.

Conveniently, in the above-described solution, the rotation of the base (A) is fulfilled by means of a system of at least two  
5 pivots, placed on the two external surfaces of the base (A), perpendicular to the central rotation axis (X) and connected to the rest of the computer (E): these pivots allow the base (A) to swing only in the prefixed direction and for no more than 90°.

10 Conveniently, according to a different practical solution, the pointing device makes it possible to unblock the freedom of inclination of the rod (B) at the pivot (C) with the base (A), along a sole predetermined direction, towards which the same rod (B) is inclined by the user, until it lies in a specific  
15 hollow (F) inside the material structure (E) that comprises all the components of the computers.

Conveniently, the above-described system works as follows: when the joystick is used, the rod (B) is constrained in its movements to take gradients no wider than a prefixed measure  
20 on the perpendicular to the base (A), i.e. compared with the stand-by position; when the device is not used, the rod is inclined by the user, in the only predetermined direction, at an angle of about 90° compared with the original perpendicular position to the base (A) and it is then laid into the specific  
25 hollow (F).

This freedom of inclination in one direction of the rod (B), restricted to the non-use of the device, can be obtained thanks to a mechanism that, for example, when the joystick is not used, unblocks totally any tie of rod(B)-base(A) inclination in the pivot (C) contemporarily deactivating the transducer function of the potentiometers: the prefixed direction for the laying in the hollow (F) is given by the same form and shape of the physical set (E) containing all the components of the computer.

10 In this solution, the rod changes its position relative either to the base (A) and to the entire computer (E).

Conveniently, according to a further practical solution, the pointing device has the rod (B) formed by two parts, a lower part (L) and an upper part (K), connected each other by means

15 of a joint (H), so that the upper part (K) can be untied from the lower part (L) and inclined at an angle of about  $90^\circ$ , while the original rod(B)-base(A) pivot remains unchanged.

Conveniently, the above-described system works as follows: when the user has finished to use the pointing device, he

20 unblocks the joint (H) that makes the upper part (K) of the rod jointed to the lower part (L), and inclines the first one (K) at an angle of about  $90^\circ$  on the second one (L), which remains in its original position perpendicular to the base (A), until he lays it (K) in a specific hollow (F) inside the

25 physical structure (E) comprising the computer and all its components (in order to minimize the overall bulk, the

physical structure may be constructed so that its upper surface is higher than the joint (H)).

The joint (H), connecting the two parts that forms the rod (B), has no direct influence on the working of the rod-base pivot (C) (whose structure and composition do not differ from the ones of a traditional joystick); therefore, as the latter has a solely mechanical function, differently from the previous solution, it has no implication for the electronic components of the device (potentiometers, analog-to-digital converters, etc.) and is confined to guarantee the passage of the electrical tension for any possible control button (D) placed on the upper part (K) of the rod.

Also in this solution, the upper part of the rod changes its position relative either to the base (A) and to the entire physical set comprising the computer (E).

Conveniently, in a different practical solution, the pointing device consists of a telescopic rod (B) that folds up, as the upper part (N) slides inside the lower body of greater section (P), which, supposing for example a rod (B) that counts three segments, slides in its turn inside the lower body (M) of greater section than all the previous ones (in order to minimize the overall bulk, the material structure (E), comprising the entire computer, may be constructed so that its external surface is higher than the upper part of the rod (B) in its folded position).

Conveniently, in the above-described solution, the rod(B)-base(A) pivot neither change nor end (the structure and composition of the pivot (C) do not differ from the ones of a traditional joystick). Therefore, when the user has finished  
5 to use the pointing device, he folds up the rod (B). The structure of the rod must permit the power to reach any possible control button (D) placed on its top, when the device is in use, i.e. when the rod is completely spread out, for example by means of a spring conducting electrical tension or  
10 a conductor spiral wire, both of them compressible in the folding phase.

Conveniently, in another different practical solution, the pointing device has a movable rod (B) engaged as a "bayonet" to the base, so that it can be unblocked by a suitable system,  
15 detached by the pivot (C) from the base (A) and placed in a specific hollow (F) of the physical set (E) comprising the entire computer.

In order to similarly compare the structure and composition of the pivot (C) to the ones of a traditional joystick, it's  
20 advisable, for example, that the joint between the same pivot (C) and the rod (B) consists of a couple of male-female plugs placed directly over the surface of the same pivot. In this way, it ensures a solid mechanical resistance and also the passage of the electrical tension that is necessary to supply  
25 power to any possible control button (D) placed at the top of the rod.

In this solution, the rod changes its position relative either to the base (A) and to the entire material structure (E) comprising the computer.

Conveniently, only a part of the rod can be movable, similarly  
5 to what it's depicted in Fig. 7 for the operation of folding.  
Conveniently, all the above-cited systems, inversely used, allow the joystick to be pulled out from the physical set of the computer.

Conveniently, the mechanisms and the specific systems used to  
10 insert the joystick in the physical set containing all the components of the computer and, by implication, to pull it out (i.e. the pivots that make the base swing in the first solution, the rod-base pivot that can be unblocked by the rod and then inclined up to about 90° along a predetermined  
15 direction in the second one, the rod formed by two parts in the third one, the telescopic rod that folds up in the fourth one, the rod engaged as a "bayonet" in the fifth one), may be manually and/or automatically performed (even without the need of physical work by the user, which can be activated also via  
20 software); their technical details are however devolved to their practical realization.

The following features constitute known art, therefore they are not herein illustrated: the way by which the rod is pivoted to the base and can be moved by the user (except for  
25 the second and fifth solution where the pivot must also permit, respectively, the total inclination of the rod at an

angle of 90° along a direction and its pulling out); the electromechanical mechanisms inside the base, such as switches and/or potentiometers, by means of which the movements exerted by the user are transformed into directional signals that can  
5 be acquired and used by the computer and are compatible with it; the placement of any possible control button on the rod and/or the base; the working and the resulting software applications of the possible control buttons.

Conveniently, the rod, the base and the possible control  
10 buttons have the best size, shape, weight and material suitable for their use and compatible with the rest of the computer, according to the project criteria and the desired aims predetermined during their practical realization (like, for example, industriability, ergonomicity, design).

#### 15 **Brief description of drawings**

The present invention is also depicted with reference to the figures of the enclosed drawings, which are deliberately drawn up schematically for illustrative reasons, therefore particular sizes and shapes may differ from the practical  
20 realization. The drawings are given as practical examples of the invention, but not to be considered restrictive.

- Figs. 1, 2 and 3 show respectively a top, front and side view of the pointing device, with the base (A), the rod (B) perpendicular to the base and a control button (D) on the  
25 upper face of the rod.

The Figures show the pointing device both in the stand-by position, when the rod is perpendicular to the base (drawn with continuous line), and in full swing, when the rod is variably inclined (drawn with dotted line).

5 The letters B', B'', B''', B'''', depict some different positions of the rod that is moved by the user; accordingly, the letters D', D'', D''', D'''', mark the position of the control button connected to the same rod.

For illustrative reasons, the material set (E) containing  
10 all the components of the computer, is not depicted in these three figures, just like B' and B'' do not appear in Fig. 3 and B''' and B'''' in Fig. 2.

- Figs. 4 and 5 show schematically how one of the proposed  
practical solution works; specifically, the pointing system  
15 takes a reduced bulk when it's bent down.

Fig. 4 shows the frontal view of the device that, from the original stand-by position, marked with continuous line and with letters without apex, is completely turned down by the user, as the base (A) rotates at an angle of about 90° (in  
20 the example, the direction follows the arrow towards the right side regarding the point of view) along one of the two central axes of its side surfaces perpendicular to the rod (B) (in the example, it's the axis X, perpendicular to the point of view), until the device lies in its suitable  
25 hollow (F) inside the material structure (E) containing the computer (this phase is marked with dotted line and letters

with apex). The base (A) is so constructed that it never sticks out of the physical set (E), even when it is bent. Fig. 5 shows the corresponding top view of the example of Fig. 4, where the finest dotted line identifies the rotation axis X.

- Figs. 6 and 7 show how two further practical solutions work, characterized by the fact that the user bends down only the rod (B) (Fig. 6) or even part of it (K) (Fig. 7).

Fig. 6 shows the frontal view of this device, where the rod (B), from the original stand-by position, marked with continuous line and letters without apex, is turned by the user around the pivot (C) at an angle of about  $90^\circ$  along the prefixed direction (in the example, the direction follows the arrow and is parallel to the front plane, towards the right side regarding the point of view), until it lies in its suitable hollow (F) inside the computer (E), as it's marked with dotted line and letters  $D^\circ$  and  $B^\circ$ .

Fig. 7 shows the practical solution where only a part (K) of the rod (B) is bent down, maintaining the original rod-base pivot (C). The rod (B) has a further pivot (H) that allows its upper part (K) to turn down at an angle of about  $90^\circ$  along a prefixed direction (in the example, the direction follows the arrow and is parallel to the front plane, towards the right side regarding the point of view), until it lies ( $K^\circ$ ) in its suitable hollow (F) inside the computer (E). The pivot (H) is located at such a height

that the lower part (L) of the rod never sticks out of the material structure (E) comprising the computer. In this figure, for explication, the part of the rod that can be inclined (K), is connected to the other part (L), by means of a small one-dimensional segment (H) that links the centre of the lower surface of (K) with the centre of the upper surface of (L); the latter is the adimensional point that forms the real "joint" between the two rectangular solids.

10 - Fig. 8 shows another practical solution of the invention, where the reduction of the bulk of the pointing system is carried out thanks to the rod that folds up. This figure shows the frontal view of the device, where the telescopic rod (B), from the original stand-by position, marked with continuous line and letters without apex, folds up until it's completely contained in its greater section (M), with the control button (D) firmly following the minor section (N) in the folding phase where they reach the position (D°) and (N°). In this figure, the pointing device has the base (A) embodied in the structure (E) of the computer, so that the greater section (M) of the rod never sticks out.

25 - Fig. 9 shows another different practical solution, where the reduction of the bulk of the pointing system is carried out by removing the rod (B) from the base (A) and placed it in a separate hollow (F) inside the physical set (E) containing the computer. In this case, the rod (B) is

movable and engaged to the base (A) as a bayonet, so that it can be detached by the pivot (C) from the base (A) and placed in position (B°) inside its suitable hollow (F) in the computer (E).

- 5 - Figs. 10, 11 and 12 show some examples of possible situations where the pointing system at issue can be used, such as in a laptop (Fig. 10), a cellular phone (Fig. 11) and a watch with processor (Fig. 12). The rod (B) of the pointing system is embodied for sizes and shape in the entire material structure (E) of the computer, as compared with the screen (S) and the keyboard (T).

In the various figures the pointing device has base, rod and control buttons shaped like a rectangular solid (except for Fig. 8, where the rod is formed by three rectangular solids of decreasing sizes, starting from the one next to the base, like a telescopic rod); the three rectangular solids have the six faces on parallel planes each other, i.e., for example, the lower bases belong to parallel planes. A control button is placed on the upper surface of the rod.

20 The rod is connected to the base by means of a small one-dimensional segment that links the centre of the lower surface of the former with the centre of the upper surface of the latter in an adimensional point that forms the real "joint" between the two rectangular solids.

25 In all the figures three types of lines are used, in order to depict the objects:

- continuous line, for the pointing device, when it's up in the stand by position, and for other fixed components of the computer.
- medium dotted line, for the various positions of the pointing device, or part of it, when it's in use.
- 5 - dotted line alternating dashes and dots, for the pointing device, when it's inserted inside the computer.

In practice, the manufacturing details may, however, vary, but still remain within the range of the idea proposed as a  
10 solution and, consequently, within the limits of the protection granted by this patent for invention.

## CLAIMS

- 1) Pointing system for portable computers characterized by the fact that it comprises:
- means to move the cursor, or other object, on the computer screen, by a pointing device like a joystick that works by moving its vertical rod (B), perpendicular to its base (A);
  - means to make the pointing system internal and joint to the computer, by its base (A), embodied into the computer (E), to which its rod (B) is perpendicularly pivoted;
  - 10 - means to reduce the bulk, by a system hiding the pointing device, or part of it, in a hollow (F) located in the physical set (E) that contains the components of the computer, so that it makes no bulk when it's not in use.
- 2) Pointing system according to claim 1, characterized by the fact that it can be used for any type of portable computers, including laptops, palmtops, pocket calculators, PDAs, cellular telephones and watches with electronic processor.
- 3) Pointing system according to claim 1, characterized by the fact that it's formed by a base (A) and a rod (B); when the device is used, the rod is pivoted, with at least two degrees of freedom, to the base nearly perpendicularly. The user controls the movement of the cursor, or other object, on the screen, by moving the rod in all directions but the perpendicular; it's also possible to provide control

buttons for the activation of software function and the transmission of commands, both on the rod and on the base.

- 4) Pointing system according to claim 1, characterized by the fact that it has variable external position and bulk according to its use by the user: as a matter of fact, when it's not used, it can be inserted, with no external bulk, into the same physical set (E) that contains all the components of the computer; on the contrary, when it's used, at least the rod (B) comes out with normal functions and bulk.
- 5) Pointing system according to claim 1, characterized by the fact that its base (A) swings round on its pivot system, at an angle of about ninety degrees regarding one (X) of its hypothetical central axes perpendicular to the rod (B). The rotation involves the entire pointing system (A, B), and the rod(B)-base(A) pivot does not change; consequently, the relation rod and rod-base pivot (C) remains unchanged. Therefore, the rod (B) follows the base (A) in the rotation, so lying down in a specific hollow (F) inside the same material structure (E) containing all the components of the computer.
- 6) Pointing system according to claim 5, characterized by the fact that the rod (B°) maintains, also in the new placement, the same position relative to the base (A°), even if it takes a different position compared with the entire computer. In this way, the user minimizes the

external bulk of the pointing system, as the rod (B), which is the bulkier component, does no more occupy external space, like the base (A) that is already partly embodied in the physical set (E) of the computer and now it shows a different face upwards.

- 7) Pointing system according to claim 5, characterized by the fact that the rotation of the base (A) is fulfilled by means of a system of at least two pivots, placed on the two external surfaces of the base (A), perpendicular to the central rotation axis (X) and connected to the rest of the computer (E): these pivots allow the base (A) to swing only in the prefixed direction and for no more than 90°.
- 8) Pointing system according to claim 1, characterized by the fact that the rod (B) is free to rotate and slant compared with its base (A), which remains fixed at the pivot (C), along a sole predetermined direction, towards which the same rod (B) is inclined by the user, until it lies in a specific hollow (F) inside the material structure (E) that comprises all the components of the computers.
- 9) Pointing system according to claim 8, characterized by the fact that, when the joystick is used, the rod (B) is constrained in its movements to take gradients no wider than a prefixed measure on the perpendicular to the base (A); when the device is not used, the rod (B) is inclined by the user, in the only predetermined direction, at an angle of about 90° compared with the original perpendicular

position to the base (A) and it is then laid into the specific hollow (F), remaining however connected to the same base from which it is indivisible even in the inclined position.

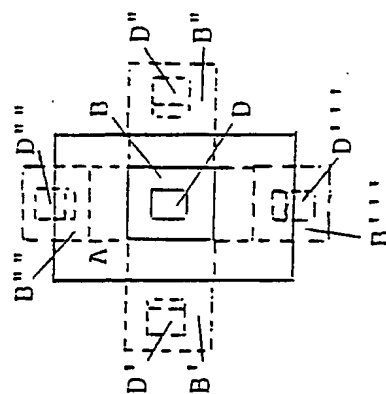
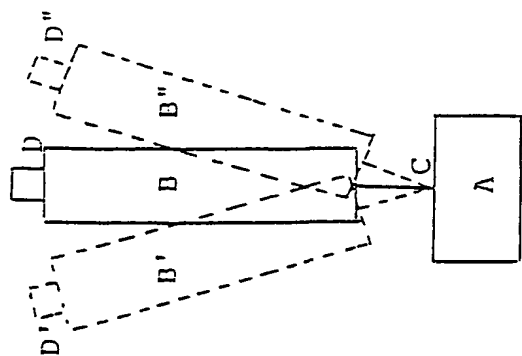
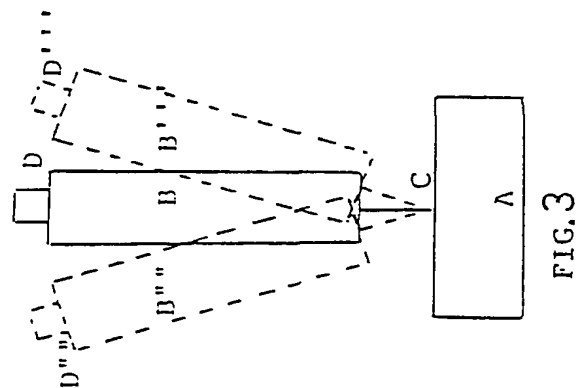
- 5 10) Pointing system according to claim 8, characterized by the fact that the inclination in one direction of the rod (B), restricted to the non-use of the device, can be obtained thanks to a mechanism that unblocks totally any tie of rod(B)-base(A) inclination in the pivot (C); the prefixed  
10 direction for the laying in the hollow (F) is given by the same form and shape of the physical set (E) containing all the components of the computer.
- 11) Pointing system according to claim 1, characterized by the fact that the rod (B) is formed by two parts, a lower part  
15 (L) and an upper part (K), connected each other by means of a joint (H), so that the upper part (K) can be untied from the lower part (L) and inclined at an angle of about 90°, while the original rod(B)-base(A) pivot remains unchanged.
- 12) Pointing system according to claim 11, characterized by the  
20 fact that, when the user has finished to use the pointing device, he unblocks the joint (H) that makes the upper part (K) of the rod jointed to the lower part (L), and inclines the first one (K) at an angle of about 90° on the second one (L), which remains in its original position  
25 perpendicular to the base (A), until he lays it in a specific hollow (F) inside the physical structure (E).

- 13) Pointing system according to claim 11, characterized by the fact that the joint (H), connecting the two parts that forms the rod (B), has no direct influence on the working of the rod-base pivot (C); therefore, as the latter has a solely mechanical function, it has no implication for the electronic components of the device and is confined to guarantee the passage of the electrical tension for any possible control button (D) placed on the upper part (K) of the rod.
- 14) Pointing system according to claim 1, characterized by the fact that it consists of a telescopic rod (B), made of more sections, that folds up, as the upper part (N) slides inside the lower body of greater section (P), which slides in its turn inside the lower body (M) of greater section than all the previous ones.
- 15) Pointing system according to claim 14, characterized by the fact that the rod(B)-base(A) pivot does not change. Therefore, when the user has finished to use the pointing device, he folds up the rod (B), by pushing the upper section (N) inside the lower sections (P, M).
- 16) Pointing system according to claim 14, characterized by the fact that, when the rod (B) is completely spread out, the lower sections (P, M) permit the power to reach any possible control button (D) placed on its top, by means of a spring conducting electrical tension or a conductor

spiral wire, or any other means able to conduct electricity, compressible in the folding phase.

- 17) Pointing system according to claim 1, characterized by the fact that the rod (B) is movable and engaged as a "bayonet" to the base, so that it can be unblocked by a suitable system, detached by the pivot (C) from the base (A) and placed in a specific hollow (F) of the physical set (E) comprising the entire computer.
- 18) Pointing system according to claim 17, characterized by the fact the joint between the pivot (C) and the rod (B) consists of a couple of male-female plugs placed directly over the surface of the same pivot. In this way, it ensures a solid mechanical resistance and also the passage of the electrical tension that is necessary to supply power to any possible control button (D) placed at the top of the rod.
- 19) Pointing system according to claim 17, characterized by the fact that only a part of the rod can be movable.
- 20) Pointing system according to claims 8, 11 and 17, characterized by the fact that the entire rod (B), or just a part of it, changes its position relative either to the base (A) and to the entire material structure (E) comprising the computer.
- 21) Pointing system according to claim 1, characterized by the fact that all these systems to reduce the bulk of the pointing device, inversely used, allows the joystick, or

part of it, to be pulled out from the physical set of the computer.



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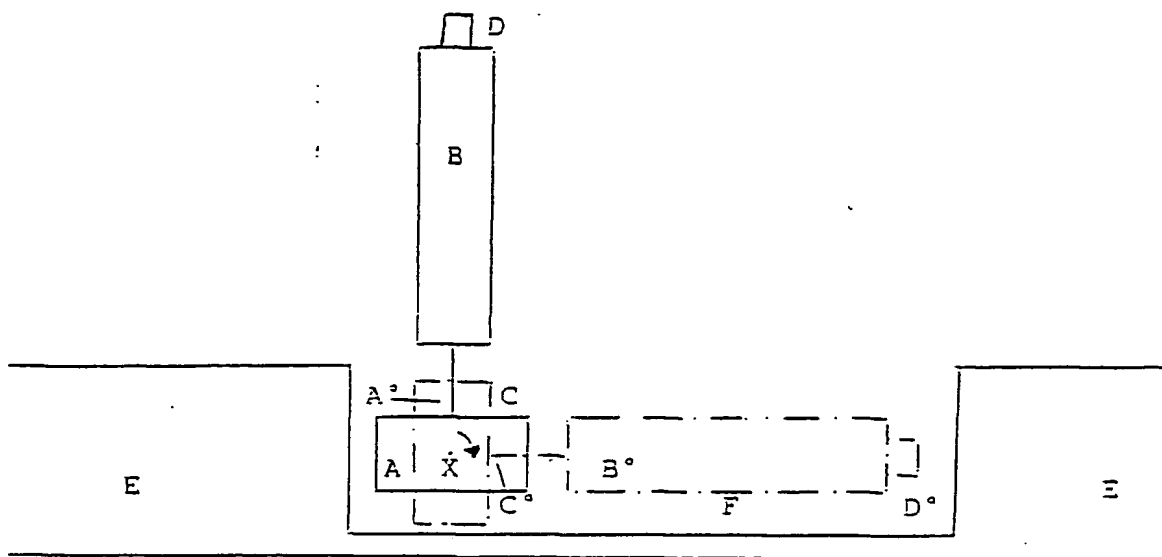


FIG. 4

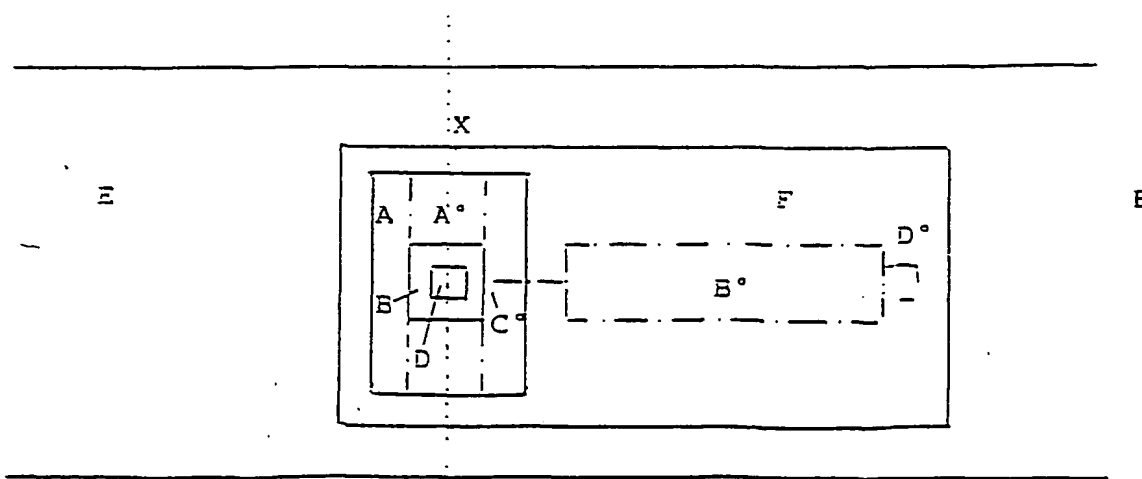


FIG. 5

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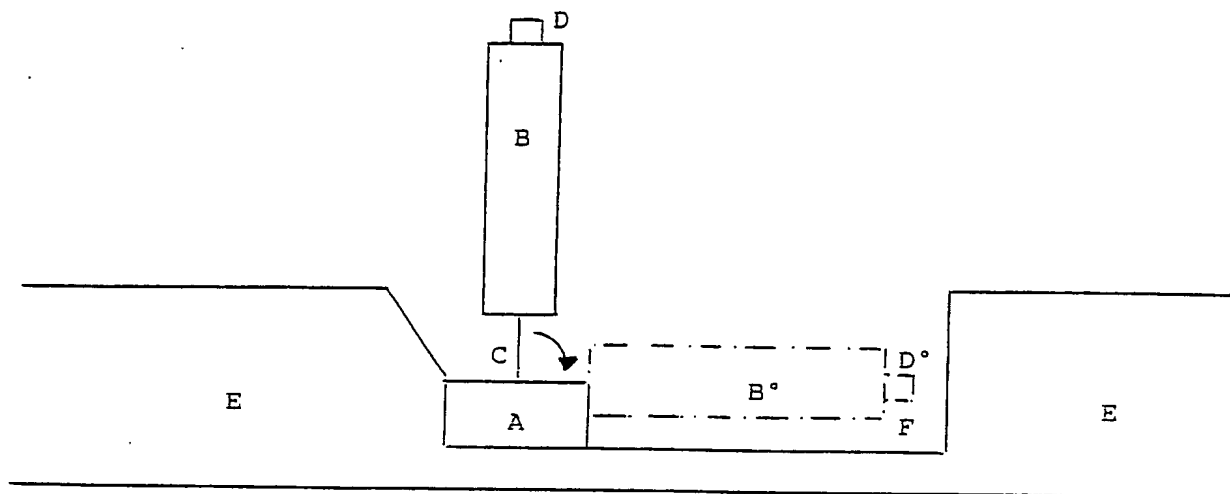


FIG. 6

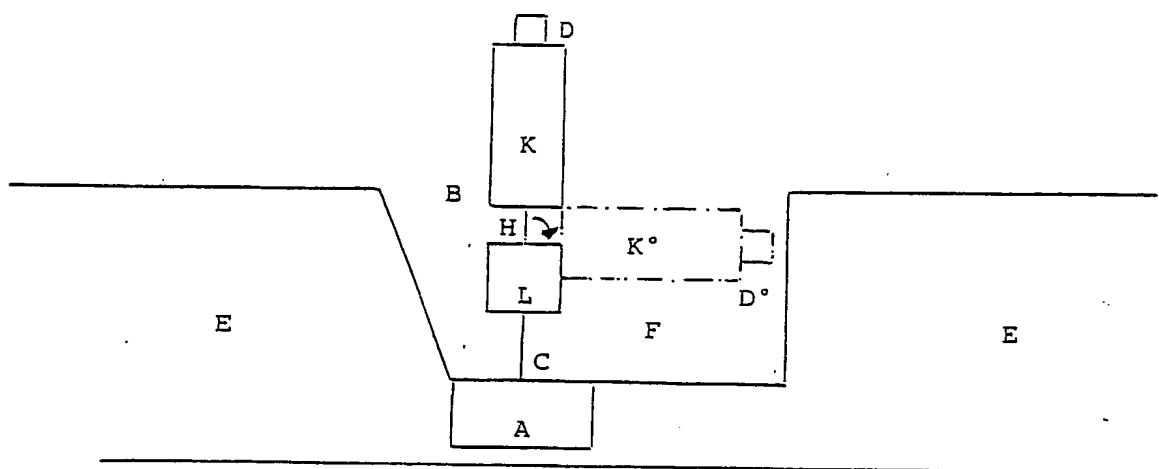


FIG. 7

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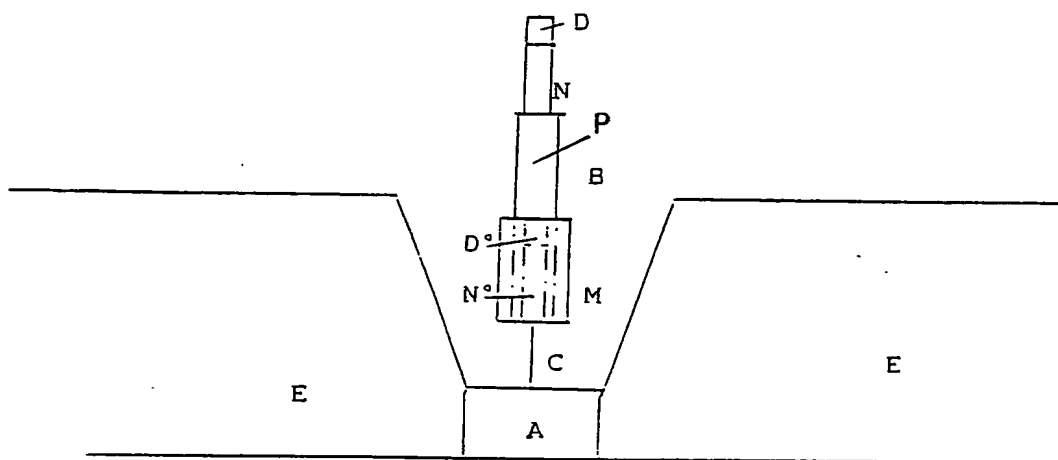


FIG. 8

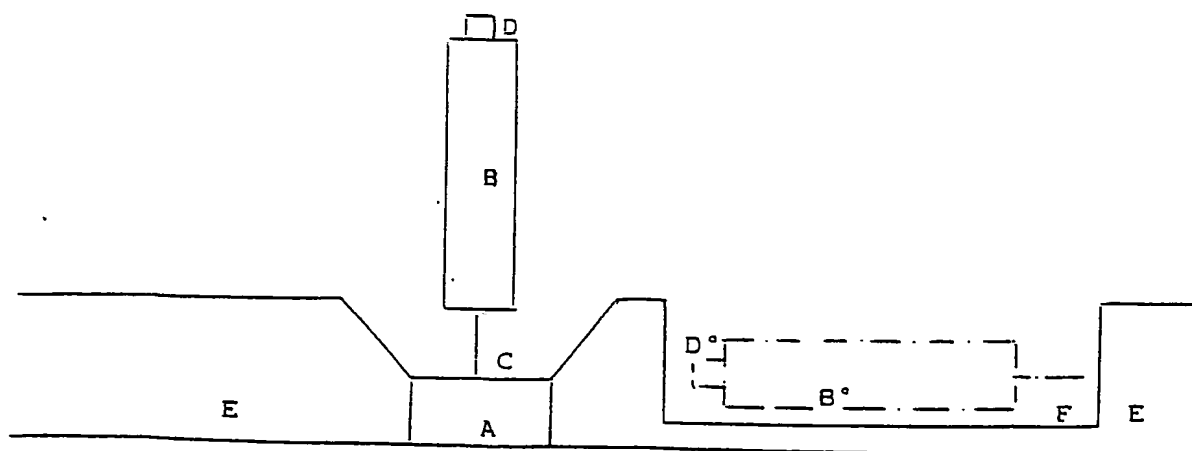


FIG. 9

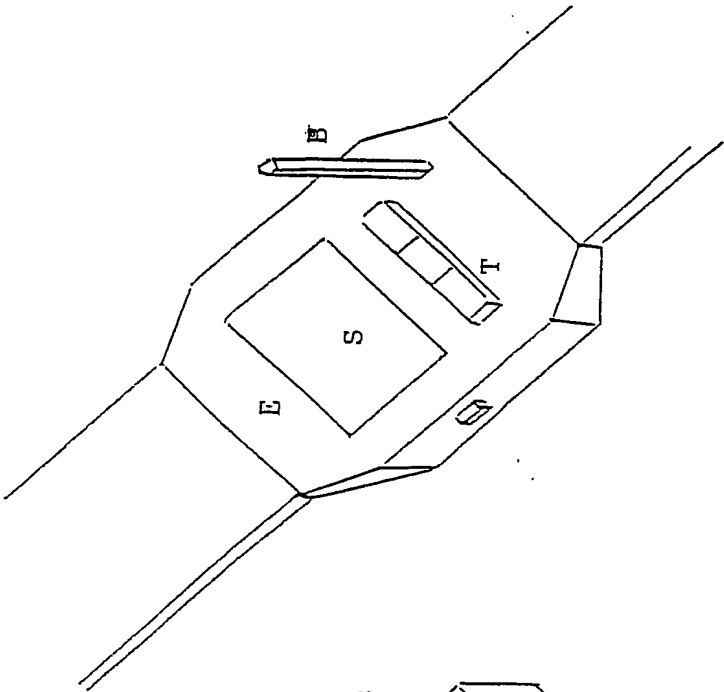


FIG. 10

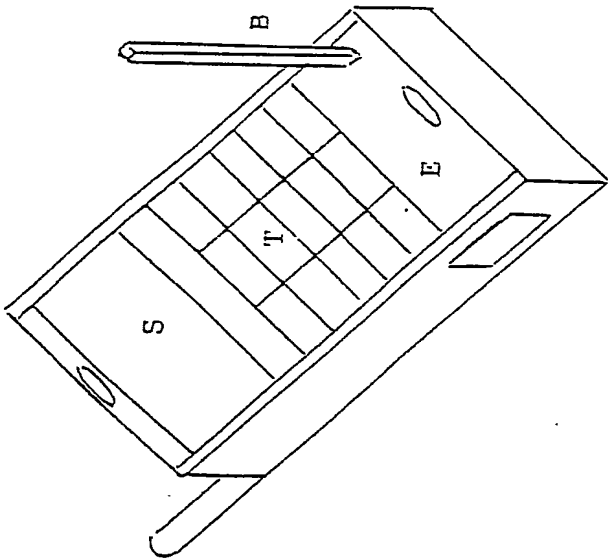


FIG. 11

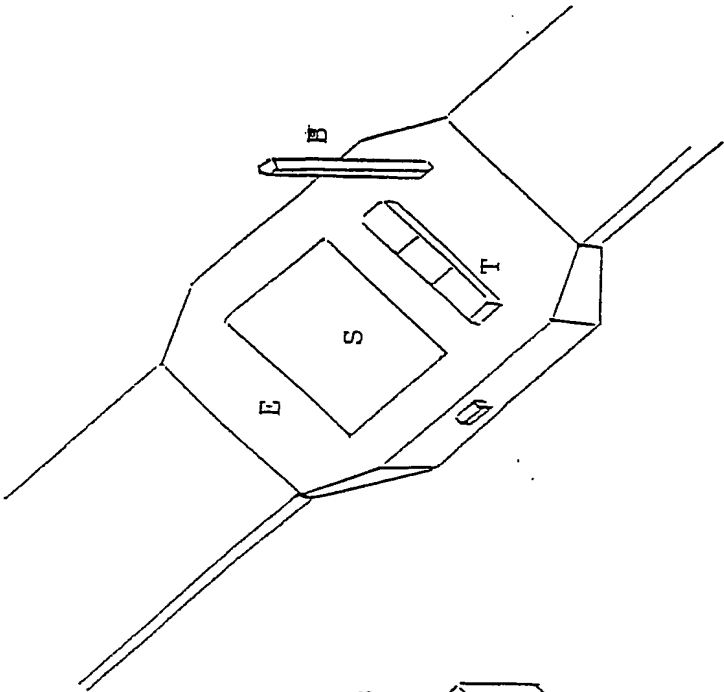


FIG. 12

## INTERNATIONAL SEARCH REPORT

In **International Application No**  
**PCT/IT 01/00227**

**A. CLASSIFICATION OF SUBJECT MATTER**  
 IPC 7 G06F1/16 G05G9/047

According to International Patent Classification (IPC) or to both national classification and IPC

**B. FIELDS SEARCHED**

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 G06F G05G

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

PAJ, IBM-TDB

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X A	US 4 395 134 A (LUCE) 26 July 1983 (1983-07-26) column 3, line 64 -column 6, line 22; figures	1,2,4, 14,15 3,17,19
X	--- "Mini-joystick: an integrated terminal key combination" IBM TECHNICAL DISCLOSURE BULLETIN, vol. 34, no. 4A, September 1991 (1991-09), pages 440-442, XP000210991 NEW YORK US	1,2,4, 14,15
A	the whole document	3
X	--- US 5 708 562 A (AGATA ET AL.) 13 January 1998 (1998-01-13)	1,2,4
A	column 3, line 4 -column 8, line 13; figures	3,6
	--- -/-	

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

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Date of the actual completion of the international search

10 September 2001

Date of mailing of the international search report

19/09/2001

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## INTERNATIONAL SEARCH REPORT

 International Application No  
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## C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	BARRATT ET AL.: "Joystick controller for pager applications" MOTOROLA TECHNICAL DEVELOPMENTS., vol. 21, February 1994 (1994-02), pages 118-119, XP000438129	1,2,4
A	MOTOROLA INC. SCHAUMBURG, ILLINOIS., US the whole document	3,14,15
A	US 5 615 083 A (BURNETT) 25 March 1997 (1997-03-25) column 4, line 10 -column 5, line 67; figures	1-3,17, 18,20
P,X	WO 01 14957 A (LEOW) 1 March 2001 (2001-03-01)	1,2,4, 8-12,14, 15
P,A	page 10, line 6 -page 16, line 28; figures	3,13,17, 19

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Information on patent family members

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WO 0114957 A	01-03-2001	AU 1069401 A	19-03-2001

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